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ΘΕΜΑ

SAFETY ON BOARD

ΤΟΥ ΣΠΟΥΔΑΣΤΗ: ΘΕΟΦΑΝΗ ΤΣΑΛΚΙΔΗ
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1				
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ΤΕΛΙΚΗ ΑΞΙΟΛΟΓΗΣΗ				

Ο ΔΙΕΥΘΥΝΤΗΣ ΣΧΟΛΗΣ :

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INTRODUCTION

GENERAL SAFETY

The safety and health of personnel must always take place over all other operational considerations. The safe operation of the vessel is dependent upon the observance of safe practices by all personnel. While responsibility for enforcing the observation of safety precautions rests largely with the Master and ships officers, it is a matter of concern to all personnel on board to see that they are observed.

All seafarers must be familiar with SOLAS, ISGOTT, IMO, STCW, and each one must be aware of responsibilities, precautions, risk assessment, and safety procedures.

PPE (personal protective equipment) are used on board in daily life so all the equipment must be in a good working condition, the crew must be familiar with it and use it correctly so that any operation or work can be carried out with safety and the appropriate measures.

The vessel as a structure is very dangerous for human life, so the appropriate familiarization should be on time for every seafarer and each one knowing his working section very well in order to prevent accidents on board.

Usual accidents must be presented to the crew by the officers in order to be ready as how to prevent it or how to act in a common accident. Training videos and weekly drills are necessary for the above purpose.

Safety signs are everywhere on board so the crew need to recognize them easily because they are very important especially in emergency situations.

Seafarers must make sure that they have a thorough knowledge of the vessel’s safety instructions and the contingency plan as soon as possible.

Safety drills must be held weekly in order to keep crew alert and ready to respond in any emergency situation.

If a seafarer is in doubt about anything, he should ask others on board who have the knowledge that he is seeking.

SOLAS (Safety of Life At Sea)

The **International Convention for the Safety of Life at Sea** (**SOLAS**) is an international maritime safety treaty. It ensures that ships flagged by signatory States comply with the minimum safety standards in construction, equipment and operation. The SOLAS Convention in its successive form is generally regarded as the most important of all international treaties concerning the safety of merchant ships.

First version.

The first version of the treaty was passed in 1914 in response to the sinking of the Titanic. It prescribed numbers of lifeboats and other emergency equipment along with safety procedures, including continuous radio watches. The 1914 treaty never entered into force due to the outbreak of the First World War. Newer versions were adopted in 1929 and 1948.

Later amendments.

The up-to-date list of amendments to SOLAS is maintained by the IMO. As the one of April 2013, the most recent amendment dates from May 2011

Sections.

The International Convention for the Safety of Life at Sea (SOLAS), 1974, requires flag States to ensure that their ships comply with the minimum safety standards in construction, equipment and operation. It includes articles setting out general obligations, etcetera, followed by an annex divided into twelve chapters. Chapter five (often called 'SOLAS V') is the only one that applies to all vessels on the sea, including private yachts and small craft on local trips as well as to commercial vessels on international passages. Many countries have turned these international requirements into national laws so that anybody on the sea who is in breach of SOLAS V requirements may find themselves subject to legal proceedings.

Chapter I – General Provisions
Surveying the various types of ships and certifying that they meet the requirements of the convention.

Chapter II-1 – Construction – Subdivision and stability, machinery and electrical installations
The subdivision of passenger ships into watertight compartments so that after damage to its hull, a vessel will remain afloat and stable.

Chapter II-2 – Fire protection, fire detection and fire extinction
Fire safety provisions for all ships with detailed measures for passenger ships, cargo ships and tankers.

Chapter III – Life-saving appliances and arrangements
Life-saving appliances and arrangements, including requirements for life boats, rescue boats and life jackets according to the type of ship.

Chapter IV – Radio communications
The Global Maritime Distress Safety System (GMDSS) requires passenger and cargo ships on international voyages to carry radio equipment, including satellite Emergency Position Indicating Radio Beacons (EPIRBs) and Search and Rescue Transponders (SARTs).

—Chapter V – Safety of navigation
This chapter requires governments to ensure that all vessels are sufficiently and efficiently manned from a safety point of view. It places requirements on all vessels regarding voyage and passage planning, expecting a careful assessment of any proposed voyage by all who are put to sea. Every mariner must take account of all potential dangers to navigation, weather forecasts, tidal predictions, the competence of the crew, and all other relevant factors. It also adds an obligation for all vessels' masters to offer assistance to those in distress and controls the use of lifesaving signals with specific requirements regarding danger and distress messages. It is different from the other chapters, which apply to certain classes of commercial shipping, in that these requirements apply to all vessels and their crews, including yachts and private craft, on all voyages and trips including local ones.

Chapter VI – Carriage of Cargoes
Requirements for the stowage and securing of all types of cargo and cargo containers except liquids and gases in bulk.

Chapter VII – Carriage of dangerous goods
Requires the carriage of all kinds of dangerous goods to be in compliance with the International Maritime Dangerous Goods Code (IMDG Code).

Chapter VIII – Nuclear ships
Nuclear powered ships are required, particularly concerning radiation hazards, to conform to the Code of Safety for Nuclear Merchant Ships.

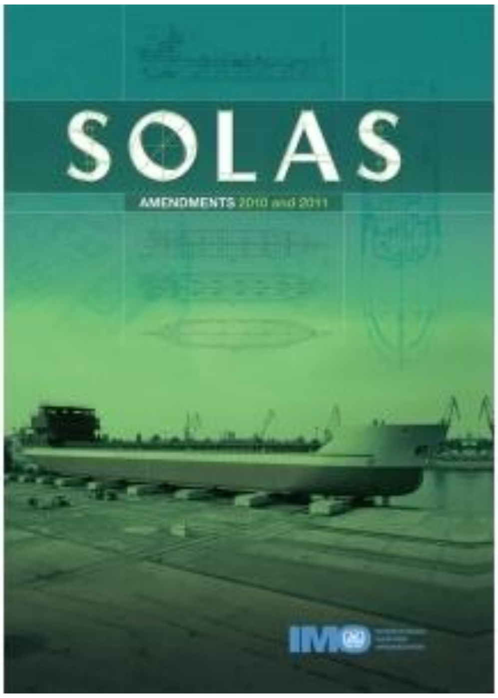
Chapter IX – Management for the Safe Operation of Ships
Requires every ship-owner and any person or company that has assumed responsibility for a ship to comply with the International Safety Management Code (ISM).

Chapter X – Safety measures for high-speed craft
Makes mandatory the International Code of Safety for High-speed craft

Chapter XI-1 – Special measures to enhance maritime safety
Requirements relating to organizations responsible for carrying out surveys and inspections, enhanced surveys, the ship identification number scheme, and operational requirements.

Chapter XI-2 – Special measures to enhance maritime security
Includes the International Ship and Port Facility Security Code (ISPS Code). Confirms that the role of the Master in maintaining the security of the ship is not, and cannot be, constrained by the Company, the charterer or any other person. Port facilities must carry out security assessments and develop, implement and review port facility security plans. It controls the delay, detention, restriction, or expulsion of a ship from a port. It requires that ships must have a ship security alert system, as well as other measures and requirements.

Chapter XII – Additional safety measures for bulk carriers
Specific structural requirements for bulk carriers over 150 meters in length.



I.M.O. (International Maritime Organization).

IMO – the International Maritime Organization – is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships.

As a specialized agency of the United Nations, IMO is the global standard-setting authority for the safety, security and environmental performance of international shipping. Its main role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and universally implemented.

In other words, its role is to create a level playing-field so that ship operators cannot address their financial issues by simply cutting corners and compromising on safety, security and environmental performance. This approach also encourages innovation and efficiency.

Shipping is a truly international industry, and it can only operate effectively if the regulations and standards are themselves agreed, adopted and implemented on an international basis.IMO is the forum at which this process takes place.

International shipping transports about 90 per cent of global trade to people and communities all over the world. Shipping is the most efficient and cost-effective method of international transportation for most goods; it provides a dependable, low-cost means of transporting goods globally, facilitating commerce and helping to create prosperity among nations and people.

The world relies on a safe, secure and efficient international shipping industry – and this is provided by the regulatory framework developed and maintained by IMO.

IMO measures cover all aspects of international shipping – including ship design, construction, equipment, manning, operation and disposal – to ensure that this vital sector remains safe, environmentally sound, energy efficient and secure.

Shipping is an essential component of any programme for future sustainable economic growth. Through IMO, the Organization’s Member States, civil society and the shipping industry are already working together to ensure a continued and strengthened contribution towards a green economy and growth in a sustainable manner. The promotion of sustainable shipping and sustainable maritime development is one of the major priorities of IMO in the coming years.

Energy efficiency, new technology and innovation, maritime education and training, maritime security, maritime traffic management and the development of the maritime infrastructure: the development and implementation, through IMO, of global standards covering these and other issues will underpin IMO's commitment to provide the institutional framework necessary for a green and sustainable global maritime transportation system.

SMS (Safety Management System)

The Safety Management System (SMS) enables effective implementation of the company's Health, Safety, Quality and Environmental protection policy. The SMS is subjected to regular audits to verify that is suitable to deliver the expectations of the ISM code, to confirm that it is effective, and that stated procedures are being followed.

Although a range of safety management topics is specified in the Code, the content and forms of the SMS is developed by the company. The SMS must demonstrate that acceptable levels of safety management are in place to protect the ship, personnel ant the marine environment.

To deliver the required levels of safety, the SMS will need to address all activities undertaken in the operation of the vessel, together with possible situations that may arise and affect the vessel or its operation.

These activities and situations will involve varying degrees of hazard to the ship, its personnel and the environment. Careful assessment of these hazard, and the probability of their occurrence, will determine the severity of the risks involved. Risk management tools are then applied to accomplish safe completion of the work, to ensure compliance with the SMS and to provide for the objective evidence needed for verification, such as

- Documented procedures and instructions
- Documentation of the verification carried out by the Responsible Person of day to day operation, when relevant to ensure compliance.

The outcome of an effective Safety Management System is a Safe System of Work.

RISK ASSESSMENT

A risk assessment is intended to be a careful examination of what, in the range of operations, could cause harm so that decisions can be made as to whether enough precautions have been taken, or whether more should be done to prevent harm. The aim is to minimize accidents and ill health on board ship.

The assessment should first establish the hazards that are present at the place of work and then identify the significant risks arising out of the work activity. The assessment should include considerations of the existing precautions to control the risk, such as permits to work, restricted access, use of warning signs, agreed procedures and personal protective equipment. The types of question that should be answered when carrying out a risk assessment are as follows:

What can go wrong?
An identification of the hazards and accident scenarios, together with potential causes and outcomes.

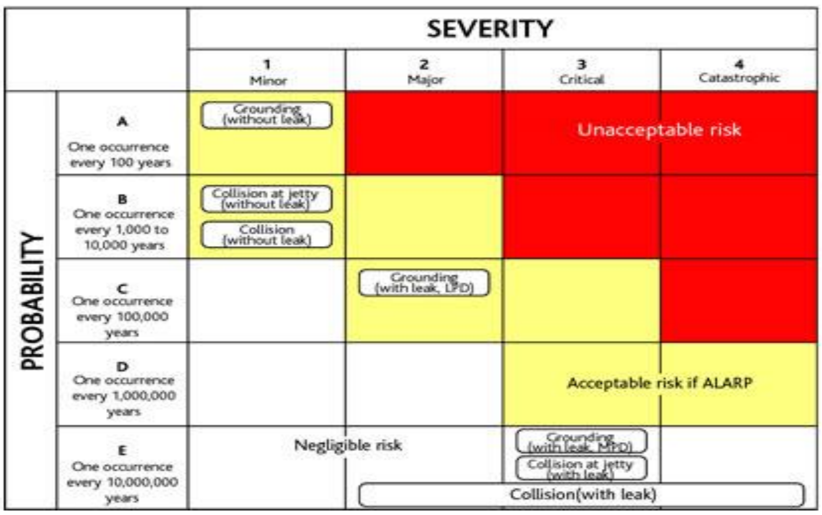
How bad and how likely?
An evaluation of the risk factors

Can matters be improved?
An identification of risk control options, such as measures to control and reduce the identified risks.

What is the effort and how much better would it be?
A determination of the benefit and effectiveness of each risk control option.

What action should be taken?
An identification of the appropriate course of action to deliver a safe activity, based on the hazards, their associated risks and the effectiveness of alternative risk control options.

Maritime Risk Analysis Results



PERMIT TO WORK SYSTEM

A permit to work system is a system of mandatory safety procedures which requires step by step formal actions to be taken by people responsible for a particular job in order to achieve a more effective control and obtain a satisfactory basis on ensuring the safety of those engaged in a high risk operation. Such a system may be instituted by use of a “permit to work”, which essentially is a document which sets out the work to be done and the precautions to be taken in doing it, together with the confirmation that the precautions were taken .

In order for ships to continue operating efficiently, it is essential that they are able to undertake repairs involving hot work in the interval between shipyard repair periods. It is of paramount importance that conditions are achieved which allow such repairs to be carried out safely. If the repairs involve entry into a dangerous space entry permit must be complied with, in addition with instruction for hot work.

Achieving the appropriate conditions for hot work and/ or entry in dangerous spaces requires stringent attention to these instructions. Masters must advise the Headquarters, if for any reason, the necessary conditions cannot be achieved, or these instructions cannot be complied with.

Before any hot work or entry in dangerous space is permitted, the Master / Chief Engineer must review the task to be undertaken and establish all necessary safety procedures, augmenting the instructions contained in this section, as condition demands. The Master Chief Engineer will undertake the task of ensuring that these procedures and instructions are observed at all times.

A Permit to Work system is a formal written system that is used to control certain types of work. It delivers a risk-based approach to safety management and requires personnel to undertake and record risk assessment in the development of a safe system of work.

The Permit to Work system must ensure that protective and precautionary measures are taken which will reduce the risks associated with a task to a level that is considered to be:

As Low As Reasonably Practicable- ALARP

RESPONSIBILITIES

DPA / Company's Department Heads

They have the following responsibilities:

- To provide necessary training to shipboard personnel on the implementation of the Permit system and on the related identification of hazards / risk assessment procedures .
- To review the shipboard risk assessment, when this is prepared by the Master, and to carry out a risk assessment when deemed necessary.
- To provide necessary guidance to the shipboard personnel on the planning and execution of each hazardous job, for which such guidance is required.
- To ensure that the necessary safety equipment and tools for the execution of any hazardous job is available onboard and in good condition.

Master

He is primarily responsible for initiating and conducting a Job Hazard Analysis (JHA) and / or a Risk Assessment (RA), supervising the safety mitigating measures and subsequently authorizing the Permit to Work. He must verify that safety precautions and measures are observed.
He must organize a work meeting prior to the commencement of the work.

Responsible Officer (Safety Officer, C/O, and or C/E):

They are responsible for consulting the Master during the JHA or the RA, providing support for the identification of the hazards involved and the safety measures to be taken. They must co-ordinate the implementation of safety measures, carry out necessary measurements, prepare the Permit form, and conduct a briefing of all personnel to be involved in the work execution.

Personnel conducting the work:

They must study the permit and relevant work procedures, and participate the briefing. They must ensure that they understand all hazards involved and the safety mitigating measures taken, accept and carry out the work in accordance to the relevant procedure. They must use the necessary safety equipment and PPE during the work execution.

PRINCIPLES OF OPERATION

A Permit is required for the following activities:

- Enclosed Space Entry
- Hot Work
- Cold Work
- Pressure Vessel / Pipeline Work
- Electrical Work
- Pump room entry
- Working aloft / overside /on ladders
- Diver's underwater inspection & repairs
- Helicopter operations

JOB HAZARD ANALYSIS / RISK ASSESSMENT:
The identification of the hazards involved and the corresponding safety measures that will reduce the hazards to an acceptable level (as low as reasonably possible) must be carried out by implementing the procedures of JHA or RA
The JHA and RA are conducted by the Master in consultation with the C/O and C/E.

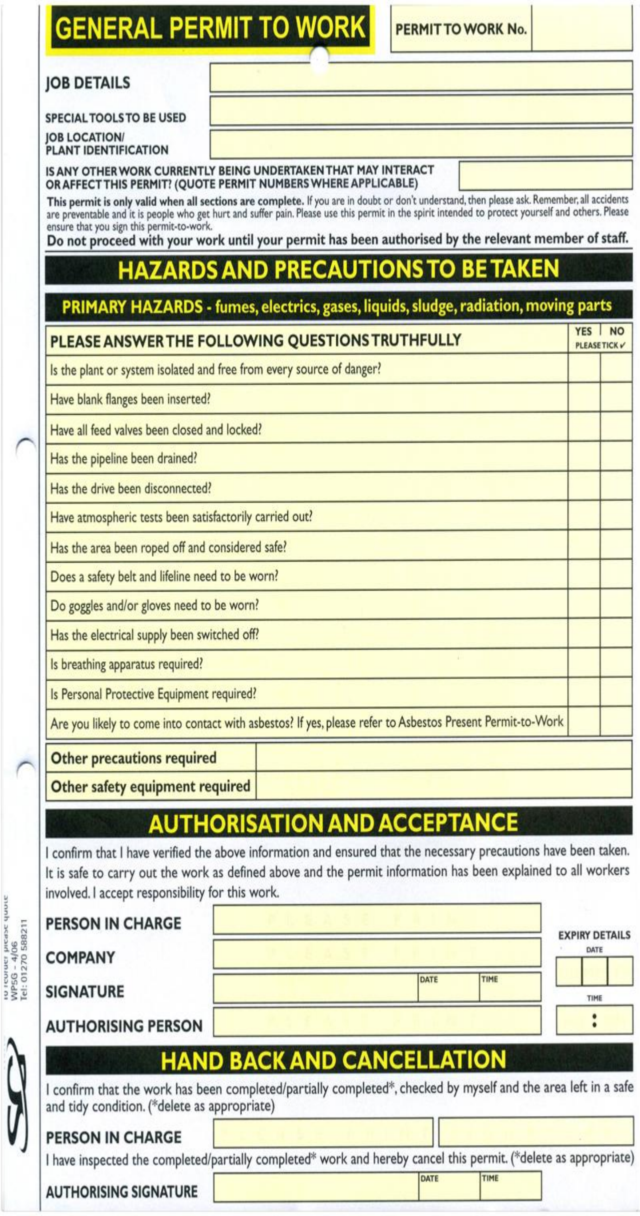
PERMIT PREPARATION:
A written permit is prepared to ensure that all necessary actions and precautions are taken, as these are detailed in the permit checklist. Relevant documentation will be available both during and after the hazardous work completion. The permit is usually prepared by the C/O.

WORK PLAN MEETING:
The purpose of this meeting is to prepare a written and detailed work plan for the hazardous work and brief all personnel involved at all levels (supervision, safety, execution of technical work) on the details of the work.
The Master , C/O, C/E, and the personnel carrying out the work and being in charge of safety precautions must participate in the meeting.

PERMIT AUTHORISATION:
Control of the permit system is gained by an established authorization process. Authorization of work that involves permits may only be given by the Master.

EMERGENCY PROCEDURE:
In the event of an emergency the Master may authorize any work necessary to preserve the safety of crew, vessel and cargo. The DPA/vessel's Superintendent should be informed as soon as circumstances allow

Here is an example of a Permit to Work form.



GENERAL PERMIT TO WORK

PERMIT TO WORK No.

JOB DETAILS

SPECIAL TOOLS TO BE USED

JOB LOCATION/
PLANT IDENTIFICATION

IS ANY OTHER WORK CURRENTLY BEING UNDERTAKEN THAT MAY INTERACT OR AFFECT THIS PERMIT? (QUOTE PERMIT NUMBERS WHERE APPLICABLE)

This permit is only valid when all sections are complete. If you are in doubt or don't understand, then please ask. Remember, all accidents are preventable and it is people who get hurt and suffer pain. Please use this permit in the spirit intended to protect yourself and others. Please ensure that you sign this permit-to-work.

Do not proceed with your work until your permit has been authorised by the relevant member of staff.

HAZARDS AND PRECAUTIONS TO BE TAKEN

PRIMARY HAZARDS - fumes, electrics, gases, liquids, sludge, radiation, moving parts

PLEASE ANSWER THE FOLLOWING QUESTIONS TRUTHFULLY	YES	NO (PLEASE TICK ✓)
Is the plant or system isolated and free from every source of danger?		
Have blank flanges been inserted?		
Have all feed valves been closed and locked?		
Has the pipeline been drained?		
Has the drive been disconnected?		
Have atmospheric tests been satisfactorily carried out?		
Has the area been roped off and considered safe?		
Does a safety belt and lifeline need to be worn?		
Do goggles and/or gloves need to be worn?		
Has the electrical supply been switched off?		
Is breathing apparatus required?		
Is Personal Protective Equipment required?		
Are you likely to come into contact with asbestos? If yes, please refer to Asbestos Present Permit-to-Work		

Other precautions required

Other safety equipment required

AUTHORISATION AND ACCEPTANCE

I confirm that I have verified the above information and ensured that the necessary precautions have been taken. It is safe to carry out the work as defined above and the permit information has been explained to all workers involved. I accept responsibility for this work.

PERSON IN CHARGE

COMPANY

SIGNATURE — DATE — TIME

AUTHORISING PERSON

EXPIRY DETAILS
DATE
TIME :

HAND BACK AND CANCELLATION

I confirm that the work has been completed/partially completed*, checked by myself and the area left in a safe and tidy condition. (*delete as appropriate)

PERSON IN CHARGE

I have inspected the completed/partially completed* work and hereby cancel this permit. (*delete as appropriate)

AUTHORISING SIGNATURE — DATE — TIME

WPSG - 4/06
Tel: 01270 588211

P.P.E. (PERSONNEL PROTECTIVE EQUIPMENT)

Protective clothing and equipment must be used by both ship personnel and visitors, when considered necessary, in order to protect them from personnel injuries.
There are many kinds of equipment that protects the body from harmful effects from exterior sources, while same hinder bodily harm to a person from unwanted incidents.
Protective equipment must not hamper the work you are to carry out and should be comfortable to use while giving you the necessary protection.
Right choice of protective equipment should give you the highest safety and the least amount of strain.

Protection garment must:

- Give sufficient protection to the skin
- Give sufficient insulation against cold and heat
- Be fire proof
- Be comfortable to use
- Be suitable for the work that is to be carried out

Loose fitting garments have a tendency to get caught in the moving parts of a machine. The same goes for wide or ragged arms. Unless the protective garment gives protection against cold and humidity, the body will stiffen and one’s reaction and attention will be reduced and may cause accidents and injuries.

Working clothes made of synthetic fibres have a tendency to be easily flammable and may cause great injuries to the body if set on fire.

Synthetic fibre clothing may also be a source of ignition by static electricity giving out sparks large enough to ignite gases.

However, it is impossible to find garments that cover all occasions, so just remember to be attentive to the clothing you are wearing considering the work you are to carry out.

Responsibilities:

Master:
The master must emphasize to his crew the necessity of proper clothing and equipment to meet the requirements of the work situation.
Safety Off.:
He is responsible for ensuring that all personnel are aware of the need to take account of individual personnel protection.
Senior Officers and Company representatives:
Set a good example to the crew by wearing the correct protective clothing and equipment and complying with safety practices and procedures.

Eye and face protection:

Visors are to be used as appropriate, e.g. when welding or gas-cutting, and when grinding on an abrasive wheel.

Goggles or **safety glasses** are forms of protective eyewear that usually enclose or protect the area surrounding the eye in order to prevent particulates, water or chemicals from striking the eyes. They are used in chemistry laboratories and in woodworking. They are often used in snow sports as well, and in swimming. Goggles are often worn when using power tools such as drills or chainsaws to prevent flying particles from damaging the eyes. Many types of goggles are available as prescription goggles for those with vision problems.

Head protection:

A **hard hat** is a type of helmet predominantly used in workplace environments such as industrial or construction sites to protect the head from injury due to falling objects, impact with other objects, debris, rain, and electric shock. Suspension bands inside the helmet spreads the helmet's weight and the force of any impact over the top of the head. A suspension also provides space of approximately 30 mm (1.2 inch) between the helmet's shell and the wearer's head, so that if an object strikes the shell, the impact is less likely to be transmitted directly to the skull. Some helmet shells have a mid-line reinforcement ridge to improve impact resistance.
Blue-collar workers, especially union shop construction workers engaged in occupations that require protective equipment are sometimes referred to as "**hard hats**".
A **bump cap** is a lightweight hard hat using a simplified suspension or padding and a chin strap. Bump caps are used where there is a possibility of scraping or bumping one's head on equipment or structure projections, but are not sufficient to absorb large impacts, such as that from a tool dropped from several stories.

Ear protection:

An **earplug** is a device that is meant to be inserted in the ear canal to protect the user's ears from loud noises or the intrusion of water, foreign bodies, dust or excessive wind.

Earmuffs are objects designed to cover a person's ears for protection. They consist of a thermoplastic or metal head-band, that fits over the top or back of the head, and a pad at each end, to cover the external ears.

Foot protection:

A **steel-toe boot** (also known as a **safety boot**, **steel-capped boot** or **safety shoe**) is a durable boot or shoe that has a protective reinforcement in the toe which protects the foot from falling objects or compression, usually combined with a mid sole plate to protect against punctures from below.
Although traditionally made of steel, reinforcement can also be made of a composite material, a plastic such as thermoplastic polyurethane (TPU) or even Aluminum. Steel-toe boots are important in the construction industry and in many industrial settings. Occupational safety and health legislation or insurance requirements may require the use of such boots in some settings, and may mandate certification of such boots and the display of such certification directly on the boots. The markings on the boot label will indicate the national or international standards that the boot was intended to meet, and identify the level of protection offered for impact, penetration, electric shock, and chemical hazards. Footwear for use in chemical processing or semiconductor manufacturing may also be rated to dissipate static electricity while still protecting the wearer from electric shock.
Safety footwear now comes in many styles, including sneakers and clogs. Some are quite formal, for supervising engineers who must visit sites where protective footwear is mandatory.

Safety shoes/boots shall be worn by all personnel when working in the following areas:

- Outside locations including mooring decks
- Cargo decks
- All machinery spaces and workshops
- Galleys and preparation rooms
- All tanks, holds and void spaces
- In accommodation spaces when undertaking repair work
- When emergency drills are held
- In other areas as directed by the master

Hand protection:

Gloves must be worn whenever possible except when operating rotating machines tools.
Gloves are often relied upon to prevent cuts, abrasions, burns, and skin contact with chemicals that are capable of causing local or systemic effects following dermal exposure. Commonly available glove materials provide only limited protection against many chemicals. Therefore it is important to select the most appropriate glove for a particular application and to determine how long it can be worn, and whether it can be reused.
It is important to know the performance characteristics of gloves relative to the specific hazard.

Body protection:
Protective clothing or overalls shall be worn as proper to give adequate protection against foreseeable risks within the relevant work area.
Boilers suits must be worn at all times when working:

- In the engine room, pump room or any other space containing machinery.
- In any area outside the accommodation or bridge.
- During storing operations.
- With paint or blasting equipment.
- With scaling, drilling, grinding, or cutting equipment.
- When handling acids or other chemicals.

All work clothing must be close fitting with no loose flaps scarves or belts and without bulging pockets. Boiler suits should have full length sleeves and legs. The front should be fastened to the top of the chest and there should be no loose pocket flaps. They should be changed and washed frequently to avoid the accumulation of oil and chemicals that might lead to skin irritation and for risks of dermatitis or skin cancer from prolonged contacts with various minerals oils.

Safety harness:

Safety harness must be used at any time work that is being performed aloft, outboard of the vessel or when required to work at a height above deck anywhere on the vessel. A safety harness, including a shock absorber measuring 1.25 m in length and lifeline must be used when working:

- Up masts or funnels
- On stages, chairs or cradles
- Over side
- Rigging gangways or accommodation ladders
- In lifeboats or on davits
- In any situation where there a risk of falling more than two meters. This requirement specifically includes working from a cradle, stage or bosun chair and includes working over side.

TORCHES AND PORTABLE LIGHTS

Only torches that have been approved for use in flammable atmosphere by a competent authority are to be used on board. Torches used with alkaline batteries must have manufacturer’s approval. Portable lights for use anywhere outside the engine room or accommodation must be similarly approved.

BREATHING EQUIPMENT

Respiratory protective equipment of the appropriate type is essential for protection when work has to be done in conditions of irritating, dangerous or poisonous dust, fumes or gases. The equipment may be either a respirator, which filters the air before it is breathed or breathing apparatus which supplies air or oxygen from an uncontaminated source. The selection of the correct respiratory protective equipment for any given situation requires consideration of the nature of the hazard, the severity of the hazard, work requirements and conditions, and the characteristics and limitations of available equipment. Advise on selection and the use and maintenance of the equipment is contained in the relevant Flag State standards which should be available to all those concerned with the use of respiratory protective equipment on board ship.

BREATHING APPARATUS (BA)

A self-contained breathing apparatus, or SCBA, sometimes referred to as a compressed air breathing apparatus (CABA), or simply breathing apparatus(BA), is a device worn by rescue workers, firefighters, and others to provide breathable air in an "Immediately Dangerous to Life or Health" atmosphere (IDLH). When not used underwater, they are sometimes called industrial breathing sets. The term "self-contained" means that the breathing set is not dependent on a remote supply (e.g., through a long hose). If designed for use under water, it is called SCUBA (self-contained *underwater* breathing apparatus).

SCBA typically has three main components: a high-pressure tank (e.g., 2,216 to 4,500 psi (15,280 to 31,030 kPa), about 150 to 300 atmospheres), a pressure regulator, and an inhalation connection (mouthpiece, mouth mask or face mask), connected together and mounted to a carrying frame.

A self-contained breathing apparatus may fall into two different categories. These are open circuit and closed circuit.

EMERGENCY ESCAPE BREATHING DEVICES (EEBD’S)

It is a device that is used to evacuate with safety, a dangerous environment that lacks normal breathing conditions caused by smoke from fire, gas leaks etc.

PORTABLE GAS DETECTION EQUIPMENT

A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.
Gas detectors can be used to detect combustible, flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in locations, such as on oil rigs, to monitor manufacture processes and emerging technologies such as photovoltaic. They may be used in firefighting.

SAFETY SIGNS ON BOARD SHIP

Safety signs on board ship alert the crew to hazards, equipment, escape routes, etc. This article describes the use of, and standards behind the production of, signs on board ship and asks - can signs identifying enclosed spaces play a part in reducing accidents in these areas?

In the marine industry signs on ships now serve a vital function but it was not always so. On a square rigger running the easting down through the roaring forties, I am sure that there were no carefully placed signs warning of strong winds and slippery decks, or notices on each yard arm recommending that one should hold on tightly whilst securing the gasket - with one hand, of course.

The sea is still the same dangerous place but since the days of sail, the inevitable march of time has forced the industry to acknowledge new challenges, dangers and lifestyles while at the same time, reducing accident rates and introducing safer working practices throughout. Signage has been an important part of this change and this fact has been acknowledged not only by management but by the regulatory bodies. In the maelstrom of technical and administrative duties that go with new build, ship transfer and operations, someone somewhere has to consider signage. In order to do this, they have to take many things into account, not least the current regulatory requirements. There will be conflict, but the issue will invariably be resolved using sensible judgment and the risk assessment process.

The international nature of shipping has required commonality of signage for many years. Although not entirely universal, the adoption of various IMO resolutions has lead to a degree of standard signage onboard vessels which has become more and more familiar to mariners from all nations. As international trade, travel and mobility of labor has increased in recent years there has been a realization that Health and Safety signs used ashore should follow the marine industry and move towards the standardization of graphical symbols and the colour of signs in all countries.

INTERNATIONAL ORGANIZATION FOR STANDARISATION

The International Organization for Standardization (ISO) is a worldwide federation of national standards bodies (ISO member bodies). Each member body has the right to be represented on a technical committee if they have an interest in a particular subject. The committee works to prepare the International Standard in liaison with international organizations, both governmental and non-governmental.
Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.
Technical Committee ISO/TC 145 is currently working towards making a standard set of graphical symbols and colours for all signs. The standard will be used by all Technical Committees within ISO charged with developing specific safety signage for their industry. It will contain a list of registered signs which will be regularly revised as more graphical symbols are standardized by ISO.

In preparing the new standard for publication the technical committee has made particular reference to ISO 3864 which gives guidance for the shape and colour of each safety sign including the graphical symbols. The objective is to ensure that only graphical symbols with the highest comprehension credentials are used and the use of the registered list of safety sign symbols will lead to a progressively improved degree of comprehension across all industries internationally.
It is essential that safety signs, their meaning and the action to be taken forms part of the formal induction and training process on joining a vessel. With the international nature of ships and their crews, standard signage will assist managers to fulfill their obligations to identify hazards, mark the location of emergency equipment, life saving appliances and the means of escape from accommodation and under deck areas.
The intention of International Standards relating to signage is to communicate the safety message using graphical symbols and colours that are universally understood and known by all members of society, thereby removing one of the barriers to good safety management created by different languages.

With color green we found all of the below:

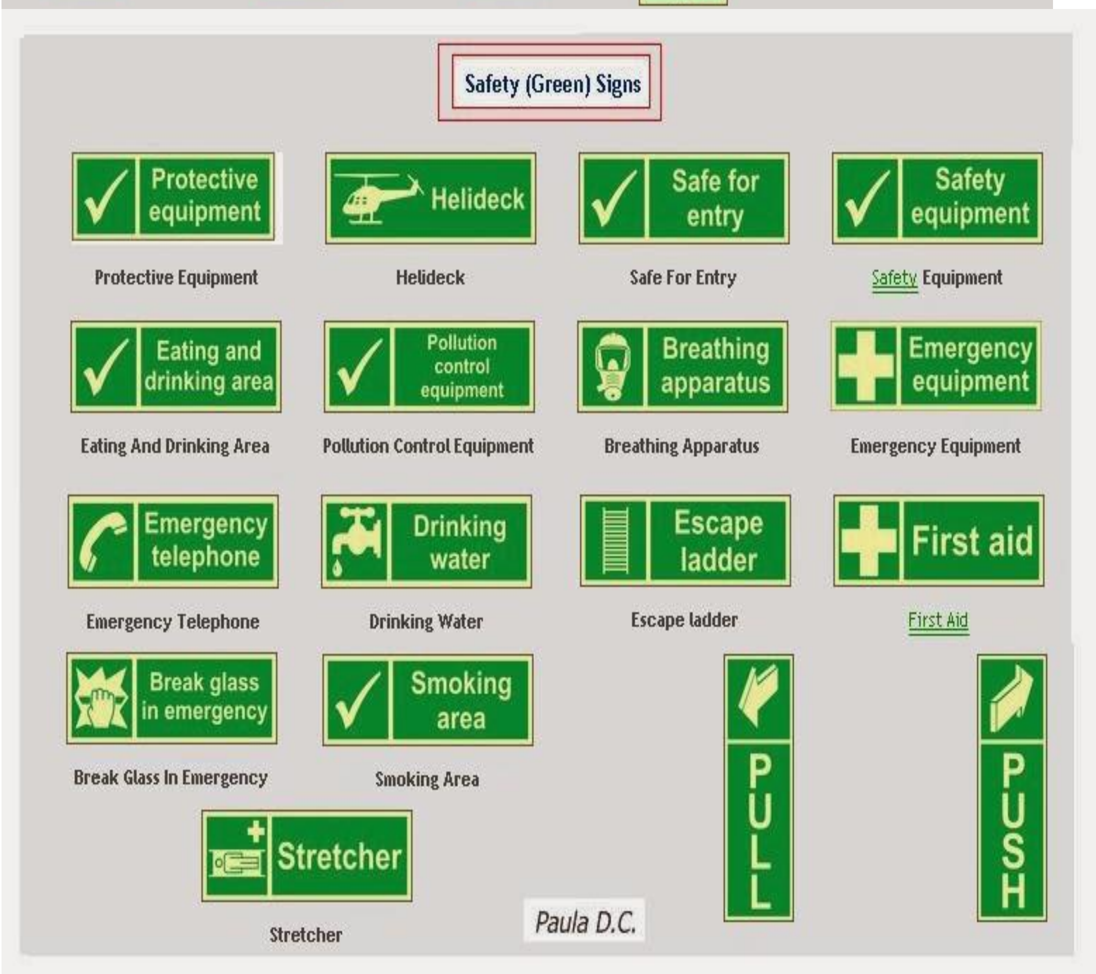
- Life saving app. Symbols
- Safety signs
- Direction signs

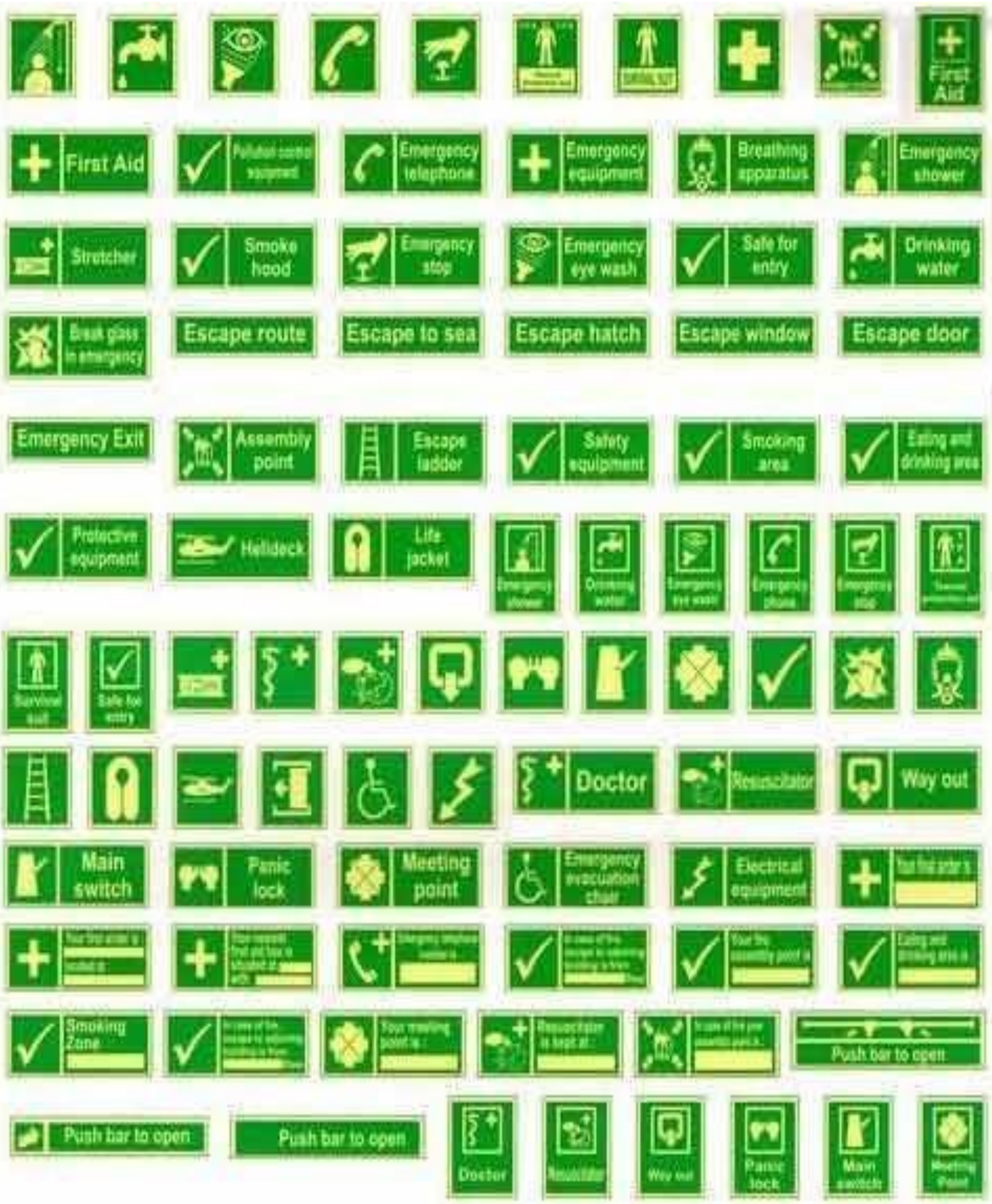
With color red we found all of the below:

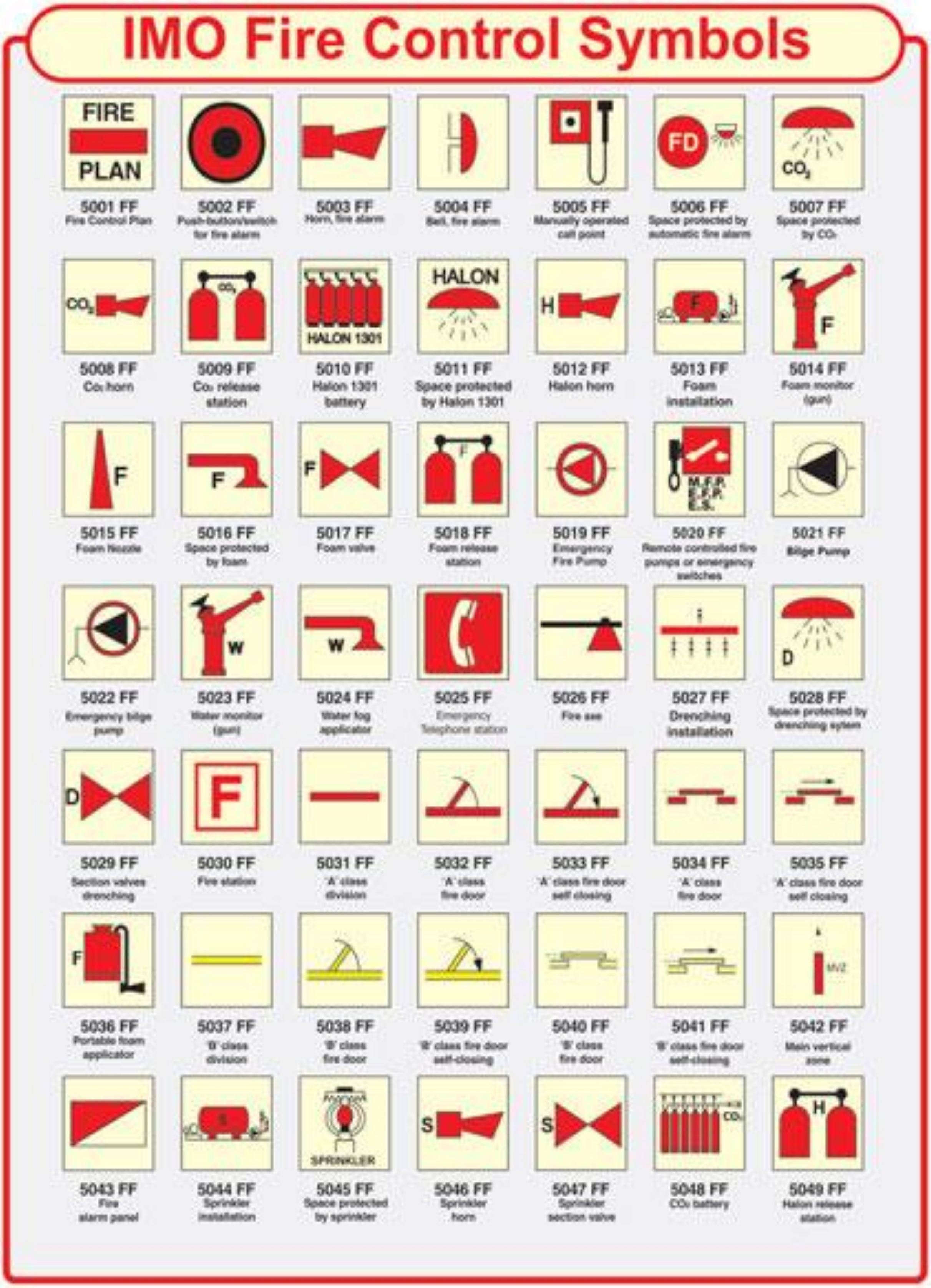
- Fire control symbols
- Fire equipment signs
- Prohibition signs

With color blue the mandatory signs and with color yellow all hazard signs


Evacuation and First Aid Signs
LIFEBOAT
RESCUE BOAT
LIFERAFT
Drinking Water
EMBARKATION LADDER
EVACUATION SLIDE
LIFEBUOY
EEBD
Emergency Escape Breathing Devices (EEBD)
LIFEJACKET
CHILD'S LIFEJACKET
IMMERSION SUIT
Lifejackets under seats
ASSEMBLY STATION
SURVIVAL CRAFT PORTABLE RADIO
SURVIVAL CRAFT DISTRESS SIGNALS
ROCKET PARACHUTE FLARES
MEDICAL LOCKER
EMERGENCY TELEPHONE
STRETCHER
First Aid


Safety (Green) Signs
Protective equipment
Protective Equipment
Helideck
Helideck
Safe for entry
Safe For Entry
Safety equipment
Safety Equipment
Eating and drinking area
Eating And Drinking Area
Pollution control equipment
Pollution Control Equipment
Breathing apparatus
Breathing Apparatus
Emergency equipment
Emergency Equipment
Emergency telephone
Emergency Telephone
Drinking water
Drinking Water
Escape ladder
Escape ladder
First aid
First Aid
Break glass in emergency
Break Glass In Emergency
Smoking area
Smoking Area
PULL
PUSH
Stretcher
Stretcher
Paula D.C.

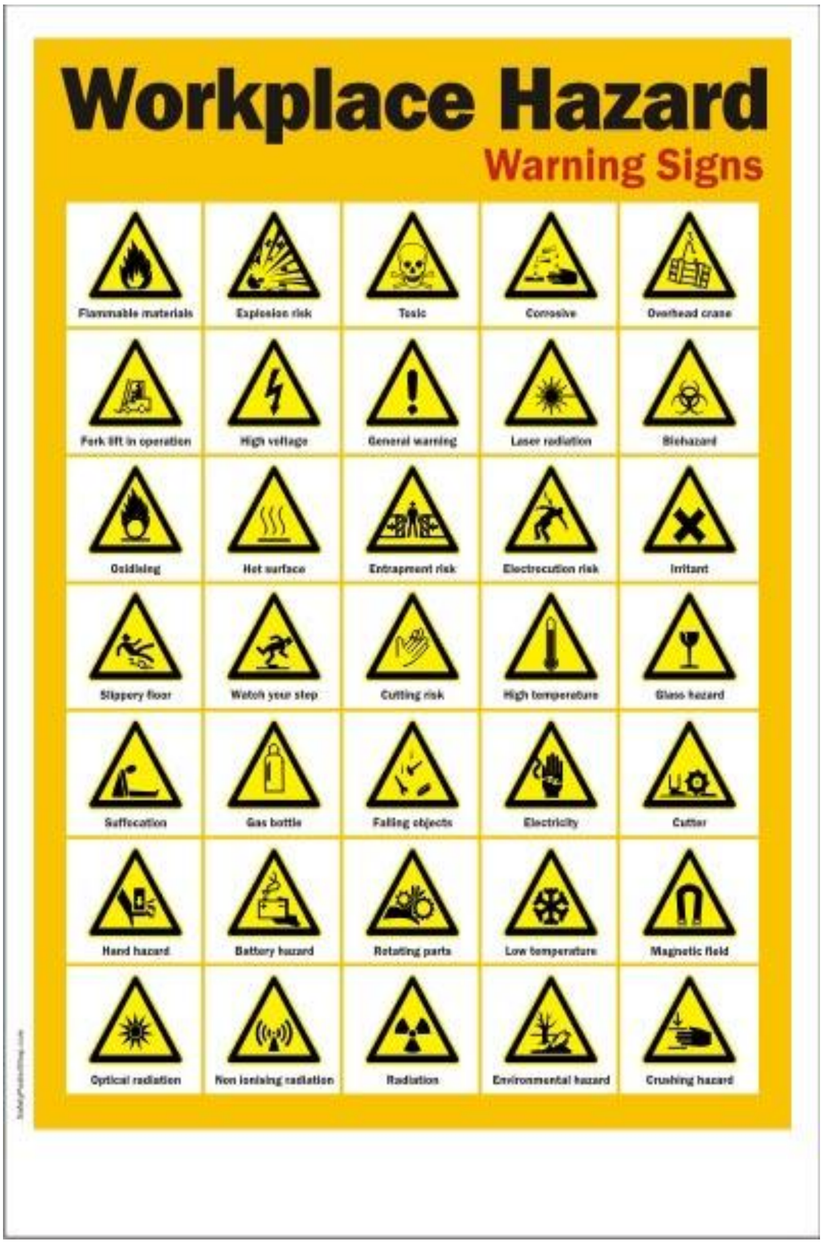

First Aid
First Aid
Emergency telephone
Emergency equipment
Breathing apparatus
Emergency shower
Stretcher
Smoke hood
Emergency stop
Emergency eye wash
Safe for entry
Drinking water
Break glass in emergency
Escape route
Escape to sea
Escape hatch
Escape window
Escape door
Emergency Exit
Assembly point
Escape ladder
Safety equipment
Smoking area
Eating and drinking area
Protective equipment
Helideck
Life jacket
Survival suit
Safe for entry
Doctor
Resuscitator
Way out
Main switch
Panic lock
Meeting point
Emergency evacuation chair
Electrical equipment
Smoking Zone
Push bar to open
Push bar to open
Push bar to open
Doctor
Resuscitator
Way out
Panic lock
Main switch
Meeting Point



IMO Fire Control Symbols
FIRE
PLAN
5001 FF
Fire Control Plan
5002 FF
Push-button/switch for fire alarm
5003 FF
Horn, fire alarm
5004 FF
Bell, fire alarm
5005 FF
Manually operated call point
FD
5006 FF
Space protected by automatic fire alarm
CO_2
5007 FF
Space protected by CO_2
CO_2
5008 FF
CO_2 horn
CO_2
5009 FF
CO_2 release station
HALON 1301
5010 FF
Halon 1301 battery
HALON
5011 FF
Space protected by Halon 1301
H
5012 FF
Halon horn
F
5013 FF
Foam installation
F
5014 FF
Foam monitor (gun)
F
5015 FF
Foam Nozzle
F
5016 FF
Space protected by foam
F
5017 FF
Foam valve
F
5018 FF
Foam release station
5019 FF
Emergency Fire Pump
M.F.P.
E.F.P.
E.S.
5020 FF
Remote controlled fire pumps or emergency switches
5021 FF
Bilge Pump
5022 FF
Emergency bilge pump
W
5023 FF
Water monitor (gun)
W
5024 FF
Water fog applicator
5025 FF
Emergency Telephone station
5026 FF
Fire axe
5027 FF
Drenching installation
D
5028 FF
Space protected by drenching sytem
D
5029 FF
Section valves drenching
F
5030 FF
Fire station
5031 FF
'A' class division
5032 FF
'A' class fire door
5033 FF
'A' class fire door self closing
5034 FF
'A' class fire door
5035 FF
'A' class fire door self closing
F
5036 FF
Portable foam applicator
5037 FF
'B' class division
5038 FF
'B' class fire door
5039 FF
'B' class fire door self-closing
5040 FF
'B' class fire door
5041 FF
'B' class fire door self-closing
MVZ
5042 FF
Main vertical zone
5043 FF
Fire alarm panel
S
5044 FF
Sprinkler installation
SPRINKLER
5045 FF
Space protected by sprinkler
S
5046 FF
Sprinkler horn
S
5047 FF
Sprinkler section valve
CO_2
5048 FF
CO_2 battery
H
5049 FF
Halon release station


.4.
MANDATORY SIGNS
ON SELF-ADHESIVE PHOTOLUMINESCENT VINYL
Keep locked shut when not in use
Keep clear when door is closing
This hatch must be kept closed at sea
This door must be kept closed at sea
Watertight door keep shut
Automatic watertight door keep clear
Ensure this door is fully closed
Exit Keep clear
Fire exit keep clear
SIZE:300x100mm
Protective equipment stored inside
This hatch must be kept closed at sea
Think safety
Protective clothing must be worn in this area
Personal protective equipment is provided. USE IT
Accidents must be reported
Plastic only
Incineration only
Food waste only
The avoid injury take care in the shower during rough weather
Comminution only
No plastic or food waste
Compaction only
Persons entering this area must comply with safety regulations
All visitors to report to the duty officer on the bridge
Ventilation to be used prior to entry
This door must be kept closed at sea


.3.
MANDATORY SIGNS
ON SELF-ADHESIVE PHOTOLUMINESCENT VINYL
Keep clear
Close this door at night
Close these doors at night
This door to be kept locked when not in use
To be kept unlocked during working hours
Fire door keep locked shut
Automatic fire door keep clear
Staircase must be kept clear at all times
Fire escape keep clear
Gangway keep clear
Fire door keep shut


Workplace Hazard
Warning Signs
Flammable materials
Explosion risk
Toxic
Corrosive
Overhead crane
Fork lift in operation
High voltage
General warning
Laser radiation
Biohazard
Oxidising
Hot surface
Entrapment risk
Electrocution risk
Irritant
Slippery floor
Watch your step
Cutting risk
High temperature
Glass hazard
Suffocation
Gas bottle
Falling objects
Electricity
Cutter
Hand hazard
Battery hazard
Rotating parts
Low temperature
Magnetic field
Optical radiation
Non ionising radiation
Radiation
Environmental hazard
Crushing hazard

LIFE SAVING APPLIANCES

LIFEBOATS

Lifeboat is one of the most important life-saving equipments onboard a ship, which is used at the time of extreme emergencies for abandoning a ship. Lifeboat is a smaller rigid vessel, secured onboard into davits so that it can be launched over the side of the ship with least time and mechanical assistance possible for an early escape of the crew from the ship.

A lifeboat must carry all the equipments described under SOLAS and LSA codes, which are passed for the survival at sea. This includes rations, fresh water, first aid, compass, distress signaling equipment like rockets etc. A ship must carry one rescue boat for the rescuing purpose, along with other lifeboats. One of the lifeboats can be designated as a rescue boat, if more than two or more lifeboats are present onboard a ship.

Types of Lifeboat:

There are three types of lifeboats used on merchant vessels:

Open Lifeboat:

As the name suggests, an open lifeboat has no roof and is normally propelled by manual power by using hand propelled ores. Compression ignition engine may also be provided for the propulsion purpose. However, open lifeboats are becoming obsolete now because of stringent safety norms, but one may find them in older ships.

The open lifeboat doesn’t help much in rain or bad weather and the possibility of water ingress is in the highest.

Closed lifeboat:

Closed lifeboats are the most popular lifeboats that are used on ships, for they are enclosed which saves the crew from sea water, strong wind and rough weather. Moreover, the water tight integrity is higher in this type of lifeboat and it can also get upright on its own if toppled over by waves. Closed lifeboats are further classified as – Partially enclosed and fully enclosed lifeboats.

Free fall life boat:

Free fall lifeboat is similar to an enclosed lifeboat but the process of launching is entirely different. They are aerodynamic in nature and thus the boat can penetrate the water without damaging the body when launched from the ship. The free fall life boat is located at the aft of the ship, which provides a maximum clear area for free fall.

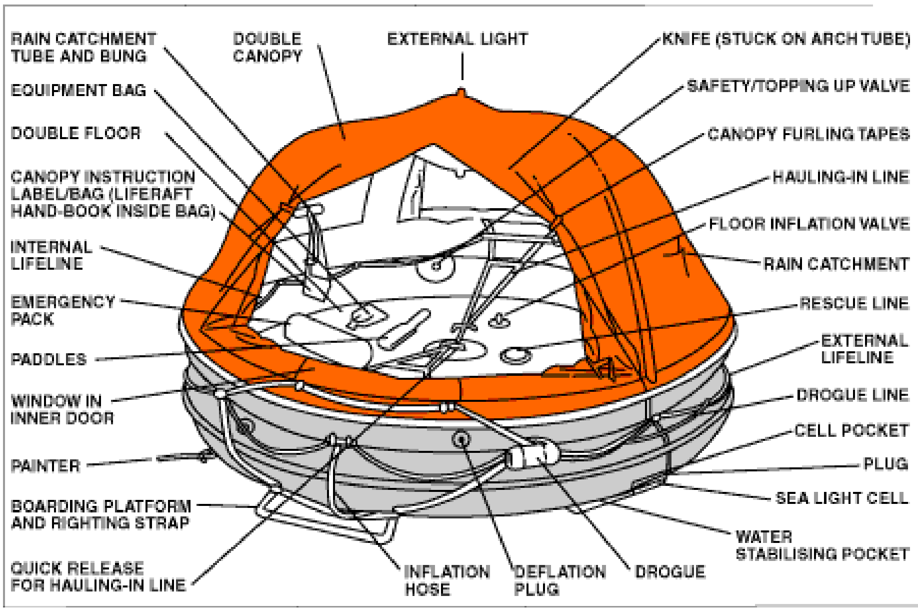
LIFERAFTS

Throw overboard liferafts are designed to be used as independent units or as part of evacuation systems. They can be stored almost anywhere on racks and ramps, saving valuable deck space and causing minimal disruption to sea views which is important for passenger ships.

Liferafts are packed in sturdy containers with a special VIKING sealing method that makes them especially durable, resistant to water ingress and makes them faster and easier to service.

Standard rafts are available in sizes:
6, 8, 10, 12, 16, 20, 25 and persons.

Self-righting rafts are available in sizes:
25, 51, 101 and 151 persons.



EPIRB (Emergency Position-Indicating Radio Beacon)

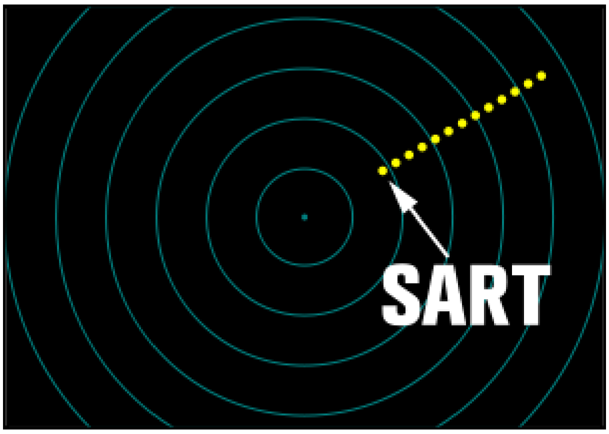
Distress radio beacons, also known as emergency beacons, PLB (Personal Locator Beacon), ELT (Emergency Locator Transmitter) or EPIRB (Emergency Position-Indicating Radio Beacon), are tracking transmitters which aid in the detection and location of boats, aircraft, and people in distress. Strictly, they are radiobeacons that interface with worldwide offered service of Cospas-Sarsat, the international satellite system for search and rescue (SAR). When manually activated, or automatically activated upon immersion, such beacons send out a distress signal.

The signals are monitored worldwide and the location of the distress is detected by non-geostationary satellites, and can be located by some combination of GPS trilateration and doppler triangulation.
The basic purpose of a distress radiobeacon is to help rescuers find survivors within the so-called "golden day" (the first 24 hours following a traumatic event) during which the majority of survivors can usually be saved.

Since the inception of Cospas-Sarsat in 1982, distress radiobeacons have assisted in the rescue of over 28,000 people in more than 7,000 distress situations. In 2010 alone, the system provided information which was used to rescue 2,388 persons in 641 distress situations.

SART (SEARCH AND RESCUE TRANSPONDER)

A **search and rescue transponder** (SART) is self-contained, waterproof transponder intended for emergency use at sea. These devices may be either a **radar-SART**, or a GPS-based **AIS-SART** (automatic identification system SART).
The radar-SART is used to locate a survival craft or distressed vessel by creating a series of dots on a rescuing ship's radar display. A SART will only respond to a 9 GHz X-band (3 cm wavelength) radar. It will not be seen on S-band (10 cm) or other radar. Shipboard Global Maritime Distress Safety System (GMDSS) include one or more search and rescue locating devices.
The radar-SART may be triggered by any X-band radar within a range of approximately 8 nautical miles (15 kilometers). Each radar pulse received causes the SART to transmit a response which is swept repetitively across the complete radar frequency band. When interrogated, it first sweeps rapidly (0.4 microsecond) through the band before beginning a relatively slow sweep (7.5 microseconds) through the band back to the starting frequency. This process is repeated for a total of twelve complete cycles. At some point in each sweep, the radar-SART frequency will match that of the interrogating radar and be within the pass band of the radar receiver. If the radar-SART is within range, the frequency match during each of the 12 slow sweeps will produce a response on the radar display, thus a line of 12 dots equally spaced by about 0.64 nautical mile (1.2 km) will be shown. When the range to the radar-SART is reduced to about 1 nautical mile (2 km), the radar display may show also the 12 responses generated during the fast sweeps. These additional dot responses, which also are equally spaced by 0.64 nautical mile (1.2 km), will be interspersed with the original line of 12 dots. They will appear slightly weaker and smaller than the original dots.
SARTs are typically cylindrical, about the size of a person's forearm, and brightly coloured.



IMMERSION SUIT

An immersion suit (or survival suit, or immersion survival suit), is a special type of waterproof dry suit that protects a person from hypothermia when immersed in cold waters, usually after abandoning a sinking or capsized vessel. The way actually an immersion suit works, is to maintain the body heat within the suit and maintain the user dry from the cold water. An immersion suit is designed to have a bright color in order to be highly visible from a long distance and safely to provide comfortable movement to the user in order to abandon the vessel. This type of immersion suits are worn in emergencies and every crew member needs to own one in the appropriate size. Furthermore, emergency drills need to occur often within the vessel in order the crew members to be agile and get in their immersion suits quickly.

LIFEJUCKET

A **personal flotation device** (abbreviated as **PFD**; also referred to as a **life jacket**, **life preserver**, **Mae West**, **life vest**, **life saver**, **cork jacket**, **buoyancy aid** or **flotation suit**) is piece of equipment designed to assist a wearer, who may be either conscious or unconscious, to keep afloat.

PFDs are available in different sizes to accommodate variances in body weight.

SAFETY DRILLS

FIRE DRILLS

The purpose of carrying out any kind of drill on the ships is for make the crew to be acquainted with various procedures to be followed during emergency situations.
It is a way to make the ship personnel acquainted with the equipment and methods that are to be used during a crises situation.

Fire drill is one such drill which holds great importance on ships. It helps the ship's crew to understand the basics of fire prevention and also help with the following:

- To prepare the crew in dealing with an emergency situation that may arise because of a fire on board ship.
- It makes the crew familiar with the task he or she has to perform in case of actual emergency.
- To train the crew in using fire fighting appliances such as SCBA, different types of fire extinguishers,CO2 flooding system, Neil Robertson Stretcher, Inert Gas System, fireman's outfit, life jackets, sprinkler system etc.
- Helps the crew to understand the procedure to operate a particular fire fighting system and the precautions that are to be taken before operating the equipment. For example there are certain imperative steps that need to be carried out before starting the CO2 fire fighting system for the engine room.
- To make the crew acquainted with the location of the emergency escape routes which would be used in case of inaccessibility of a particular zone
- To familiarize the crew with the company's fire and safety regulations, important points on personal safety and survival at the sea, recent safety circulars and M notices, and fire fighting appliances and preventive measures on ships

It is extremely important that the fire drill is carried out in as realistic manner as possible in order to make the crew aware of the situations that might arise during fire on ships.

Important points regarding fire drills on ships

- A fire drill must be conducted within 24 hours of leaving the port if more than 25% of the crew members have not taken part in the drill in the previous month.
- Muster list for the drill should be displayed throughout the ship in locations where the list can be easily accessed. The list should also be displayed at the bridge, engine room, and crew accommodation area.
- A clear fire control plan should be properly displaced in important areas throughout the ship

- Each and every crew member should be provided with clear instructions which he or she would follow during emergency. The duties of each member along with the assigned life boat number must be written on individual cards and made available inside/outside the cabin.
- The timing of the emergency drills should be changed in order to change scenarios and allow those crew members to participate who have not attended the previous dill because of duties.
- The location of the drills should also be changed to give practice to the crew in different conditions and to train them to tackle different types of fire such as machinery space fire, accommodation area fire, store room fire, cargo hold fire etc.
- The location of the muster station should be such that it is readily accessible from the accommodation and work place and is also close to the embarkation station. It should also have sufficient lights provided from emergency source.
- Each area of the ship has a different method of approach to deal with during emergency situations. Training with drills in different situations helps to prepare crew members for all types of situations.

- It is the duty of every ship personnel to get himself acquainted with the location of the emergency muster station upon joining the ship. He should also know his duties which are described in the muster list and learn how to use fire fighting appliances.

- The training manual, which contains instructions and information regarding life saving appliances and methods of survival, should be provided in each crew mess and recreation room.
- Every new crew member should be given on board training, which explains use of personal life saving appliances and survival crafts (life boats and life rafts), not later than two weeks after joining the ship.

It is important that each and every crew member performs the drill without making any mistake by memorizing his duties and understanding the important of safety of the ship and the people on board.

ABANDON SHIP DRILL

Every crew member shall participate in at least one abandon ship drill every month. The drills of the crew shall take place within 24 h of the ship leaving a port if more than 25% of the crew have not participated in abandon ship drills on board that particular ship in the previous month. When a ship enters service for the first time, after modification of a major character or when a new crew is engaged, these drills shall be held before sailing. The Administration may accept other arrangements that are at least equivalent to those classes of ships for which this is impracticable.

Each lifeboat shall be launched with its assigned operating crew aboard and maneuvered in the water at least once **every three months** during an abandon ship drill.

Each abandon ship drill shall include :

- .1 summoning of passengers and crew to muster stations with the alarm required by regulation 6.4.2 followed by drill announcement on the public address or other communication system and ensuring that they are made aware of the order to abandon ship
- Reporting to stations and preparing for the duties described in the muster list
- Checking that passengers and crew are suitably dressed
- Checking that lifejackets are correctly donned
- Lowering of at least one lifeboat after any necessary preparation for launching
- Starting and operating the lifeboat engine
- Operation of davits used for launching life rafts
- a mock search and rescue of passengers trapped in their staterooms
- instruction in the use of radio life-saving appliances.

REFERENCES

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- http://www.marineinsight.com/